

DOCUMENT RESUME

ED 290 635

SE 048 866

TITLE Science and Technology Data Book, 1988.
INSTITUTION National Science Foundation, Washington, D.C. Div. of
Science Resources Studies.
REPORT NO NSF-87-317
PUB DATE 87
NOTE 57p.; For 1987 issue, see ED 278 552.
PUB TYPE Statistical Data (110)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *College Science; Doctoral Degrees; Employment
Patterns; Financial Support; Global Approach;
Graduate Students; Higher Education; *Human
Resources; *International Trade; Minority Groups;
*Research and Development; *Science and Society;
Science Education; Tables (Data); *Technology
IDENTIFIERS *National Science Foundation

ABSTRACT

Designed to provide easy access to information pertaining to science and technology, this data book provides indicators on: (1) funding for research and development; (2) human resources utilization and supply; and (3) international science and technology efforts. Graphs and charts are used to note research and development efforts from a nationwide perspective, with expenditures from federal, industrial, and academic sources illustrated. Comparative graphs on human resources provide data on employed scientists and engineers, employed doctorates, women in science and technology, racial minorities, and school retention rates. In addition, assessments of the supply of professionals in science and technology are presented by type and number of degrees awarded, and fulltime graduate students currently enrolled. Several international science and technology indicators are outlined, such as ratios of research and development to gross national product (by country), United States patents granted to United States and foreign inventors, data on United States trade balances in high technology, and United States scientific and technical publications as compared to world publications. Three pages list other Science Resources publications. (CW)

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DATA BOOK

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Suggested Citation of This Publication

Science and Technology Data Book (NSF 87-317) (Washington, D.C., 1987).

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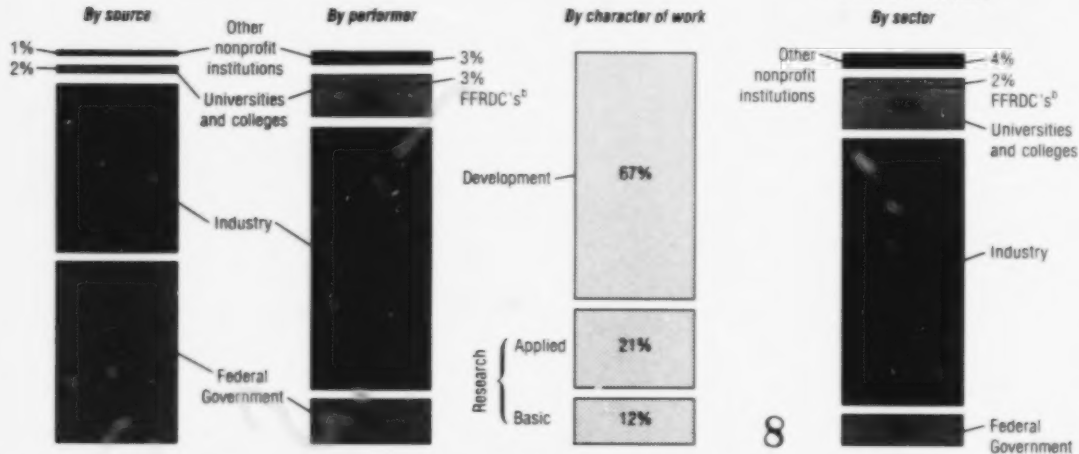
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R&D FUNDING

Figure 1. The national R&D effort

Expenditures for research and development = 131.6 billion, 1988 (est.)

Employed R&D scientists/engineers
= 810,000* 1987 (est.)



*Full-time equivalents

^bFederally funded research and development centers administered by universities and colleges

SOURCE: National Science Foundation

Additional data may be obtained from John H. Chirba, SRS, Tel: (202) 634-4625.

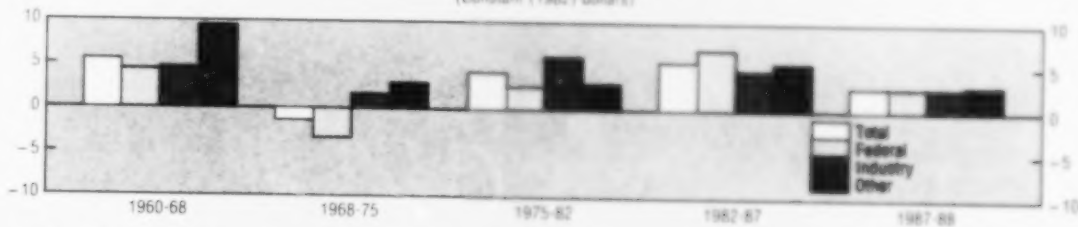
Figure 2. National R&D funding by source

[Millions of dollars]

Year	Current dollars				Constant (1982) dollars			
	Total	Federal Government	Industry	Other sources	Total	Federal Government	Industry	Other sources
1960	\$13,523	\$8,738	\$4,518	\$290	\$43,648	\$28,191	\$14,591	\$866
1968	24,805	14,928	9,006	872	85,458	39,788	23,860	1,801
1975	35,213	18,109	15,820	1,284	58,863	30,886	26,679	2,218
1982	79,316	36,505	40,096	2,715	79,316	36,505	40,096	2,715
1987 (est.)	123,050	60,350	58,570	4,130	104,345	51,154	49,693	3,498
1988 (est.)	131,600	64,550	62,625	4,425	107,186	52,539	51,029	3,598

Average annual rate of change

(Constant (1982) dollars)



*Based on GNP implicit price deflator

SOURCE: National Science Foundation

Additional data may be obtained from John R. Dinchello, SRS. Tel.: (202) 634-4625

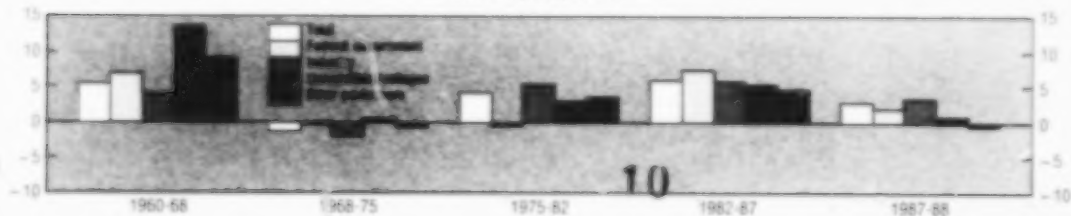
Figure 3. National R&D funding by performer

(Millions of dollars)

Year	Current dollars					Constant (1982) dollars*				
	Total	Federal Government	Industry	Universities/colleges	Other performers	Total	Federal Government	Industry	Universities/colleges	Other performers
1960	\$ 13,530	\$ 1,708	\$46,873	\$ 846	\$ 842	\$ 43,048	\$ 5,548	\$33,955	\$2,077	\$2,088
1965	24,885	3,484	17,489	2,149	1,323	85,458	9,385	46,194	5,778	4,090
1970	36,213	8,364	24,187	3,489	2,863	98,883	9,388	40,781	5,927	3,867
1982	79,310	9,141	57,986	7,278	4,904	79,316	9,141	57,986	7,278	4,904
1987 (est.)	123,090	15,450	89,200	11,190	7,250	104,345	13,079	75,083	9,439	6,144
1988 (est.)	131,000	18,400	95,950	11,725	7,525	107,186	13,328	78,186	9,529	6,123

Average annual rate of change

Constant (1982) dollars*



*Based on GNP implicit price deflator.

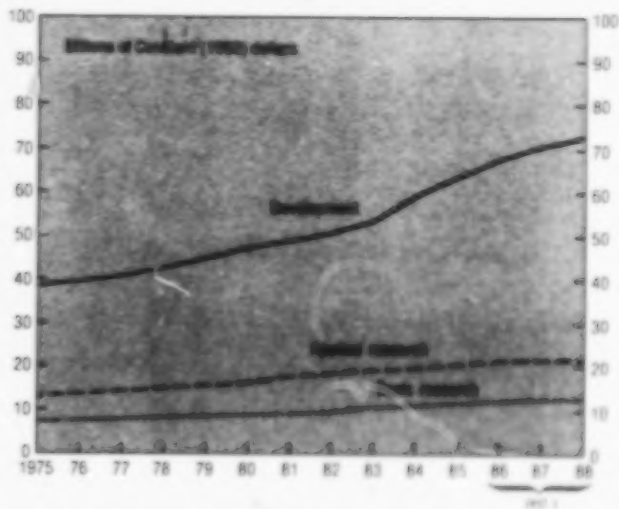
SOURCE: National Science Foundation.

Additional data may be obtained from John R. Chivukula, SRS, Phone (202) 634-4625.

Figure 4. National R&D spending by character of work

	Current dollars in billions			
	1975	1980	1982	1986
	(\$B.)	(\$B.)	(\$B.)	(\$B.)
Total	34,300	55,357	61,430	65,425
Basic	7,361	13,513	15,010	17,185
Applied	26,939	41,844	46,420	48,240

	Annual percentage change in spending		
	1975-80	1980-82	1982-86
Total	5.2%	5.0%	4.0%
Basic	4.7	2.6	0.4
Applied	4.8	5.5	4.0



*Based on GNP implicit price deflator

SOURCE: National Science Foundation

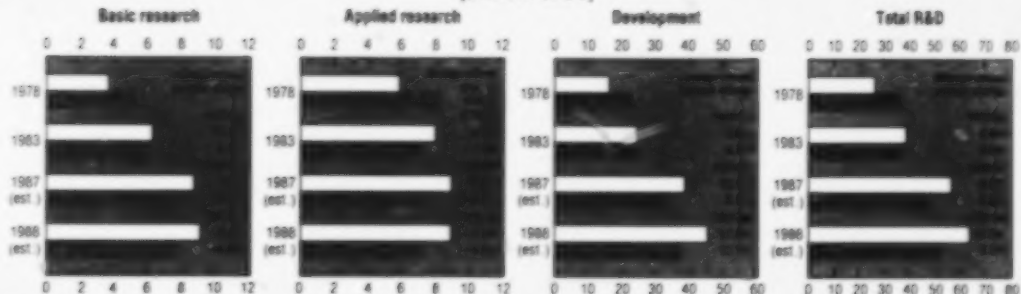
Additional data may be obtained from John R. Chirba, SRS, Tel. (202) 634-4529

Figure 5. Federal R&D obligations by character of work

[Millions of dollars]

Basic research			Applied research		Development		Total R&D	
Year	Current	Constant	Current	Constant	Current	Constant	Current	Constant
1978	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	3,000.0	3,000.0
1983	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	3,600.0	3,600.0
1987 (est.)	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0	4,500.0	4,500.0
1988 (est.)	1,600.0	1,600.0	1,600.0	1,600.0	1,600.0	1,600.0	4,800.0	4,800.0

[Billions of dollars]



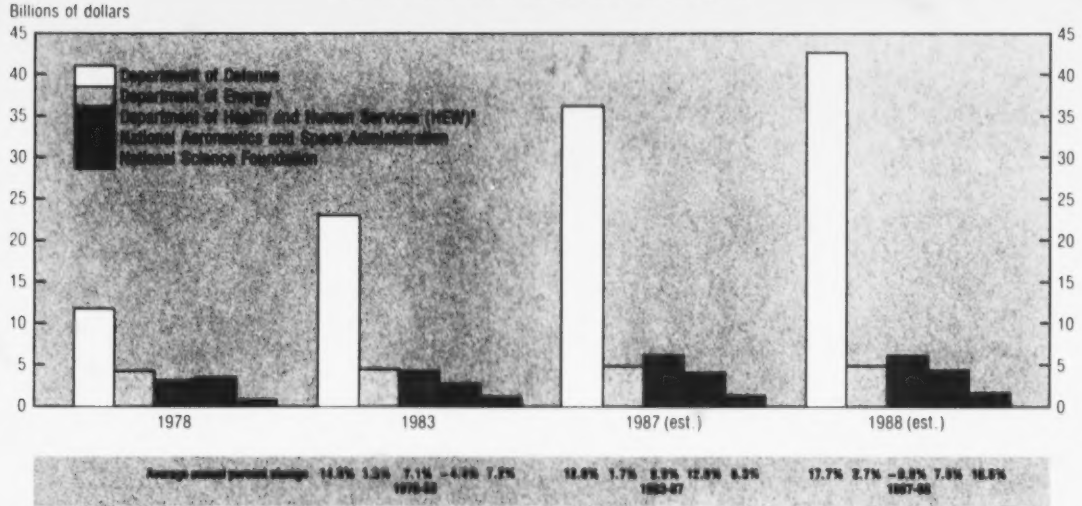
Based on GNP implicit price deflator

SOURCE: National Science Foundation

Additional data may be obtained from Margaret R. Gruccia, DRS, Tel: (202) 634-4636

Current dollars
 Constant (1982) dollars*

Figure 6. Federal R&D obligations by major agency



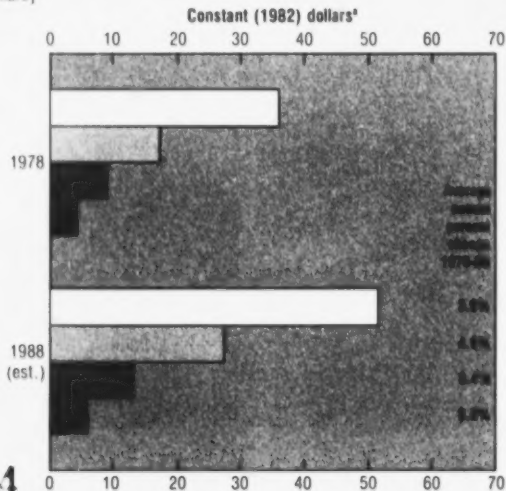
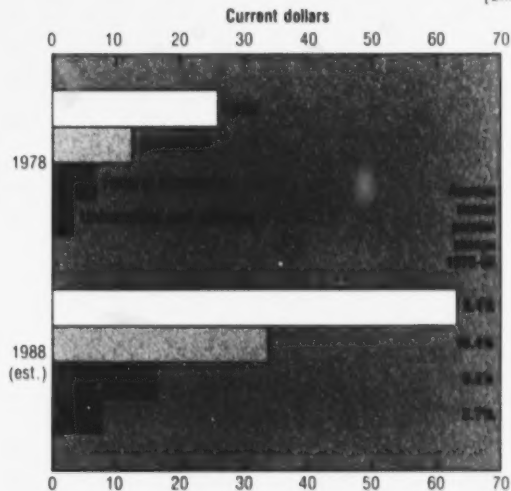
*Data for 1978 reflect new HEW health and human services programs only, and exclude data on education programs

SOURCE: National Science Foundation

Additional data may be obtained from Margaret R. Grucza, SRS, Tel: (202) 634-4636

Figure 7. Federal R&D obligations by major performer

[Billions of dollars]



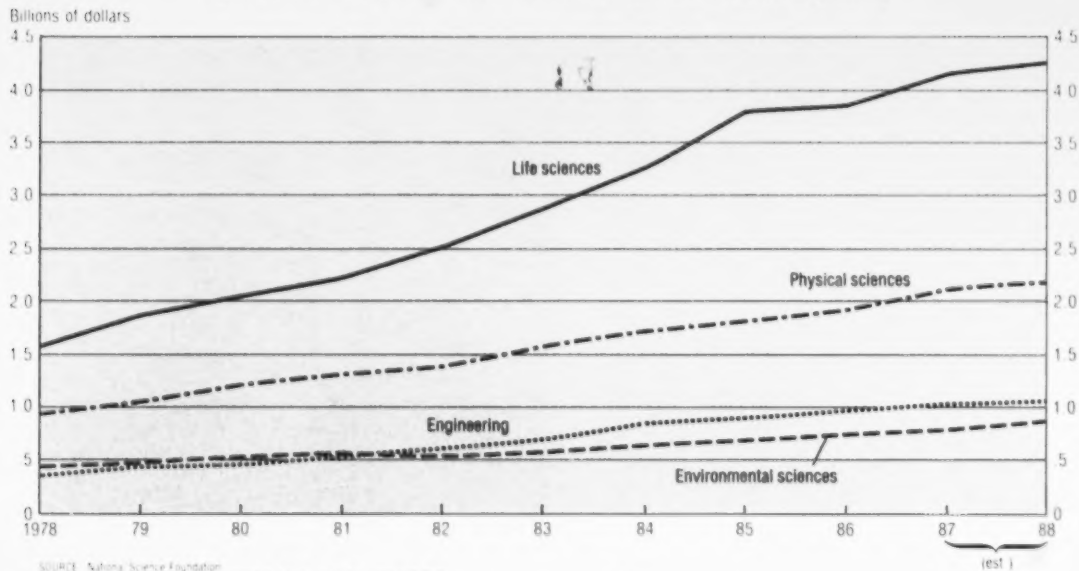
^aBased on GNP implicit price deflator

^bIncludes federally funded research and development centers

SOURCE: National Science Foundation

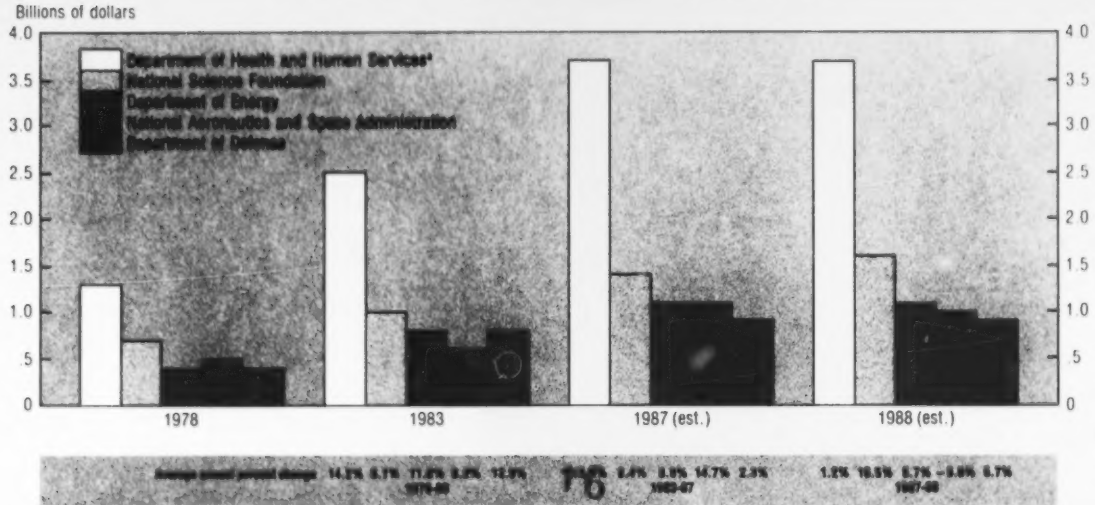
Additional data may be obtained from Margaret R. Grucza, SRS, Tel. (202) 634-4636

Figure 8. Federal obligations for basic research by major field of science / engineering



SOURCE: National Science Foundation.
 Additional data may be obtained from Margaret R. Grucza, SRS, Tel.: (202) 634-4636.

Figure 9. Federal obligations for basic research by major agency



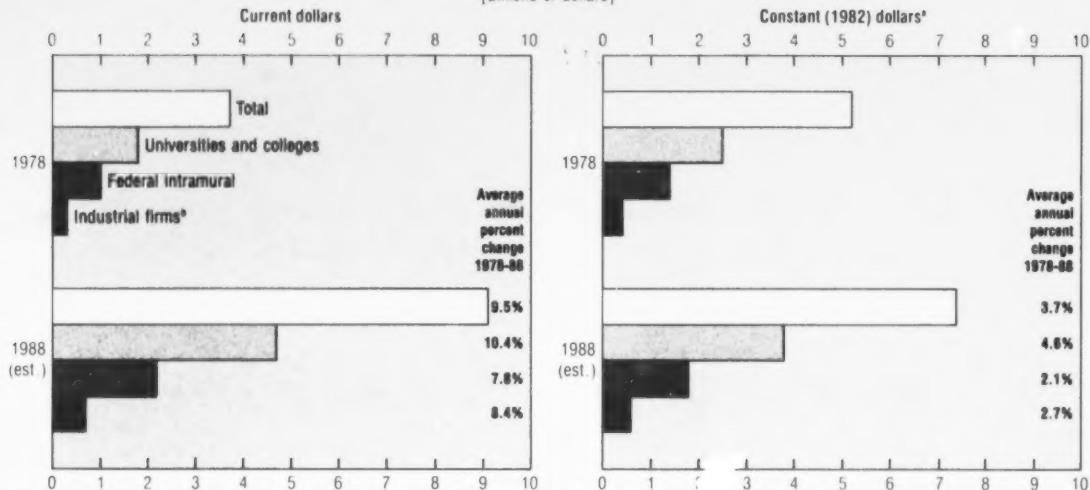
*Data for 1978 reflect HEW health and human resources programs only and exclude data on education programs

SOURCE: National Science Foundation

Additional data may be obtained from Margaret R. Grucza, SRS, Tel. (202) 634-4636

Figure 10. Federal obligations for basic research by major performer

[Billions of dollars]



^aBased on GNP implicit price deflator

^bIncludes federally funded research and development centers

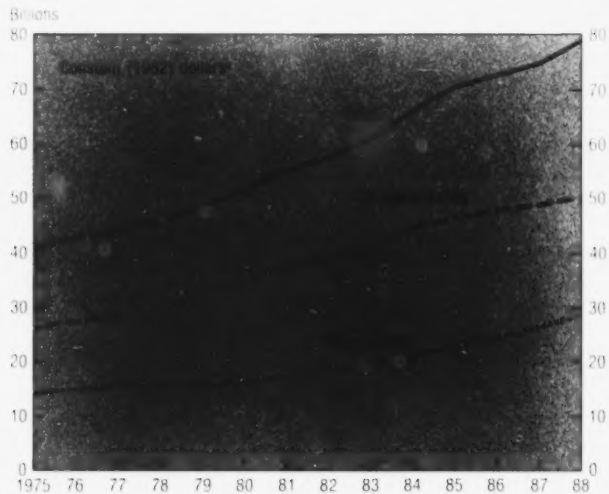
SOURCE: National Science Foundation

Additional data may be obtained from Margaret R. Grucza, SRS, Tel. (202) 634-4636

Figure 11. Industrial R&D expenditures by source of funds



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Based on NSF report presentation

SOURCE: National Science Foundation

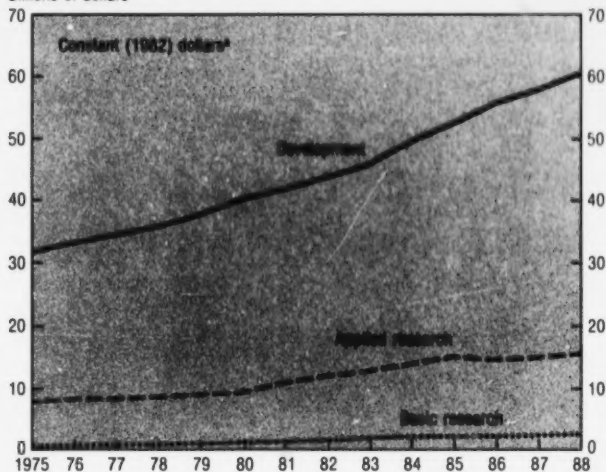
Additional data may be obtained from Thomas J. Hogan, SRS, Tel: (702) 634-4648

Figure 12. Industrial R&D expenditures by character of work

	Current dollars (billions)			
	1975	1982	1987 (est.)	1988 (est.)
Basic research	750	1,000	1,500	2,150
Applied research	4,370	12,170	17,500	18,850
Development	14,500	49,500	75,000	74,350

	Average annual rate of change Percent (1982 dollars)		
	1975-82	1982-87	1987-88
Basic research	6.3%	6.3%	9.4%
Applied research	8.8	6.1	1.5
Development	4.7	6.4	3.9

Billions of dollars

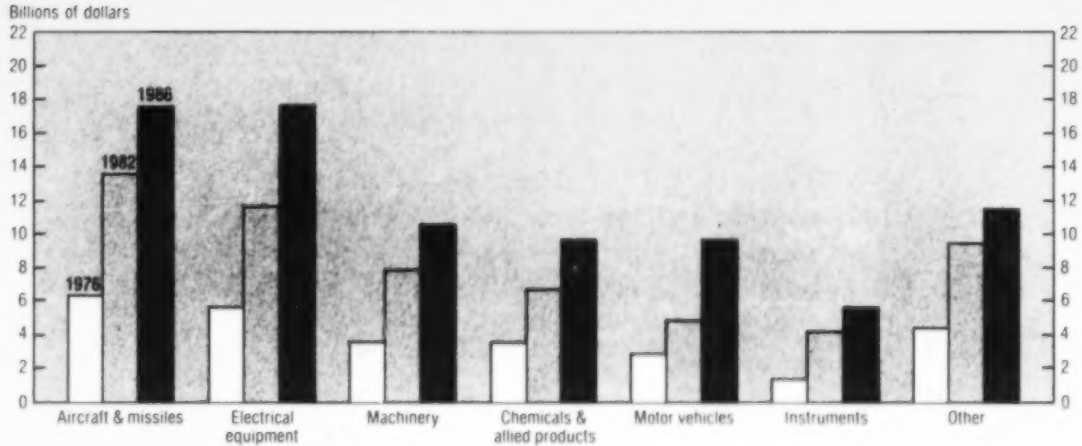


*Based on GNP implicit price deflator

SOURCE: National Science Foundation

Additional data may be obtained from Thomas J. Hogan, SRS, Tel. (202) 634-4648

Figure 13. Total R&D expenditures and R&D/sales ratio of six leading industries



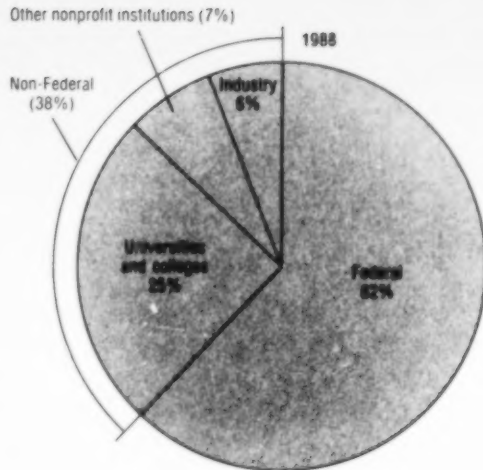
R&D/ sales ratio	12.7%	17.7	17.8	8.7%	7.7	8.1	4.9%	8.8	8.8	3.7%	4.3	4.8	3.2%	4.8	8.7	8.2%	8.9	10.3	N.A.	N.A.	N.A.
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SOURCE: National Science Foundation

Additional data may be obtained from Thomas J. Hogan, SRS, Tel. (202) 634 4648

Figure 14. Academic R&D expenditures by source

[Millions of dollars]



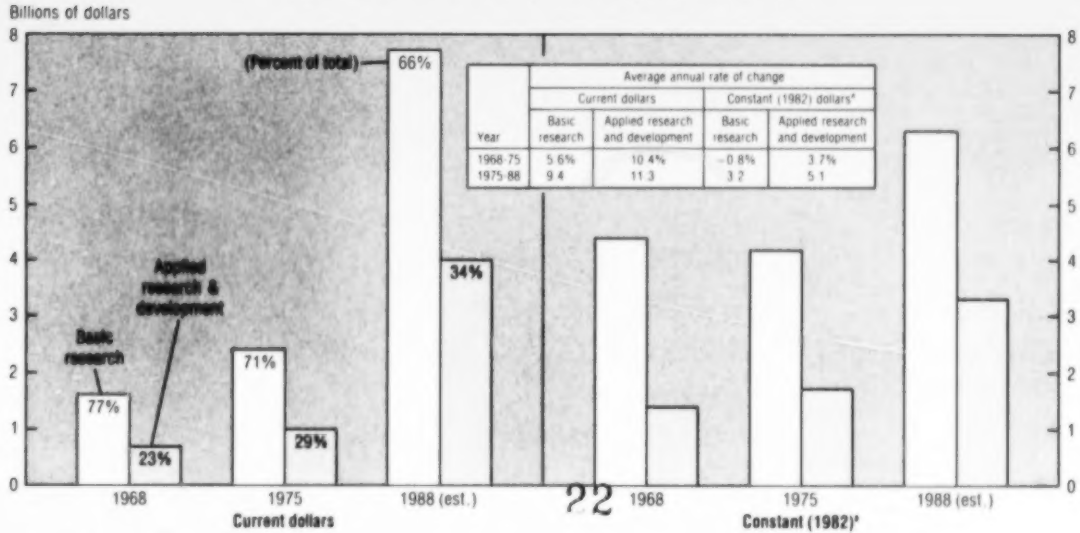
Year	Current dollars				
	Total	Federal Government	Industry	Universities/colleges	Other nonprofit
1962	\$7,276	\$4,752	\$334	\$1,890	\$500
1963	7,807	4,980	379	1,881	567
1964	8,503	5,388	458	2,024	633
1965	9,804	6,003	538	2,259	704
1966	10,800	6,750	600	2,500	750
1967					
(est.)	11,150	7,000	670	2,700	780
1968					
(est.)	11,725	7,250	750	2,900	825

NOTE: The Federal portion of academic R&D has ranged between 63 percent and 69 percent during the 1970-86 period.

SOURCE: National Science Foundation.

Additional data may be obtained from James B. Heehn, SRS, Tel. (202) 634-4673.

Figure 15. Academic R&D expenditures by character of work



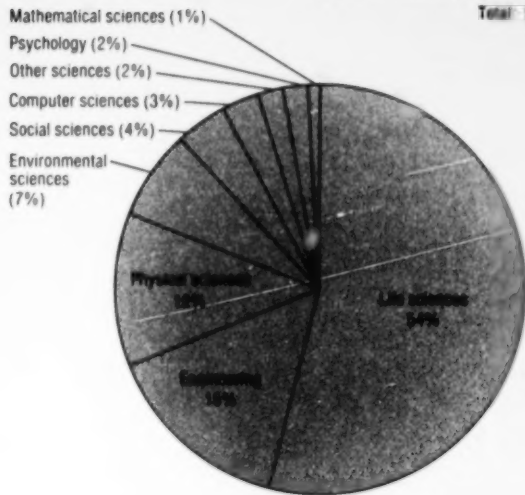
^aBased on GNP implicit price deflator

SOURCE: National Science Foundation

Additional data may be obtained from James B. Hoen, SRS, Tel: (202) 634-4673

Figure 16. Academic R&D expenditures by field: FY 1986

Total: \$16.7 billion



Academic R&D expenditures by field: FYs 1982-86

[Dollars in billions]

Field	1982	1983	1984	1985	1986
Total	7,380	7,700	8,880	9,524	10,718
Life sciences	3,870	4,220	4,617	5,190	5,746
Engineering	1,200	1,311	1,367	1,367	1,666
Physical sciences	800	887	980	1,134	1,281
Environmental sciences	500	610	660	705	774
Social sciences	264	304	370	400	464
Computer sciences	140	176	202	279	319
Other sciences	100	100	176	180	226
Psychology	100	100	147	140	160
Mathematical sciences	60	100	104	130	150

NOTE: Because of rounding, components may not add to totals.

NOTE: The distribution of academic R&D expenditures in FY 1968 was essentially the same as in FY 1986.

SOURCE: National Science Foundation.

Additional data may be obtained from James B. Hoehn, SRS, Tel: (202) 634-4673.

Figure 17. Federal obligations to universities and colleges by type of activity¹

[Millions of dollars]



¹Because of rounding, components may not add to total.

²Total obligations for the years 1961 through 1963 have been estimated by NSF on the basis of revised data on student aid provided by the Department of Education.

³Academic research and development is estimated at \$7.2 billion for 1987 and \$7.6 billion for 1988. Separate data for the other components of academic science/engineering and non-science/engineering are not available.

⁴Separate data were unavailable for this component before 1986. (Its total was included within the total for "all other S/E activities" for the years 1963 through 1985.)

⁵Based on IMF implicit price deflator.

SOURCE: National Science Foundation.

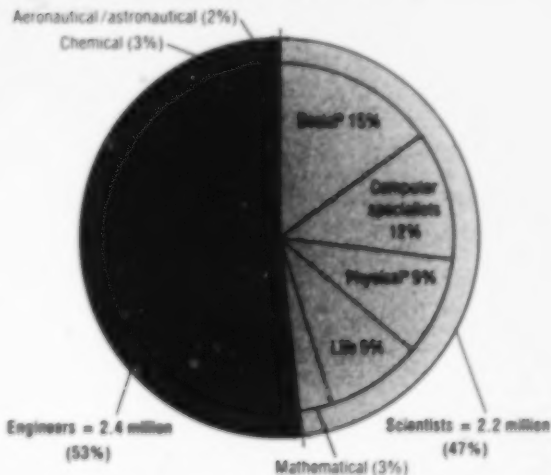
Additional data may be obtained from Margaret R. Slocum, SP5, Tel. (202) 634-4630.

HUMAN RESOURCES

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Figure 18. Employed scientists/engineers by field: 1986

Scientists/engineers total = 4.6 million



Employed scientists and engineers by field

Field	1978	1983	1986
Scientists/engineers total	2,000,000	2,200,000	2,200,000
Engineers	1,000,000	1,100,000	1,200,000
Biological	200,000	220,000	240,000
Computer specialists	150,000	160,000	170,000
Physical	100,000	110,000	120,000
Life	100,000	110,000	120,000
Mathematical	50,000	55,000	60,000
Chemical	50,000	55,000	60,000
Aeronautical/astronautical	40,000	45,000	50,000
Environmental	20,000	25,000	30,000
Psychologists	10,000	15,000	20,000
Other	100,000	110,000	120,000

*Includes environmental scientists, 2 percent of total scientists and engineers

*Includes psychologists, 5 percent of total scientists and engineers

SOURCE: National Science Foundation

Additional data may be obtained from: Michael F. Crowley, SRS, Tel: (202) 634-4884

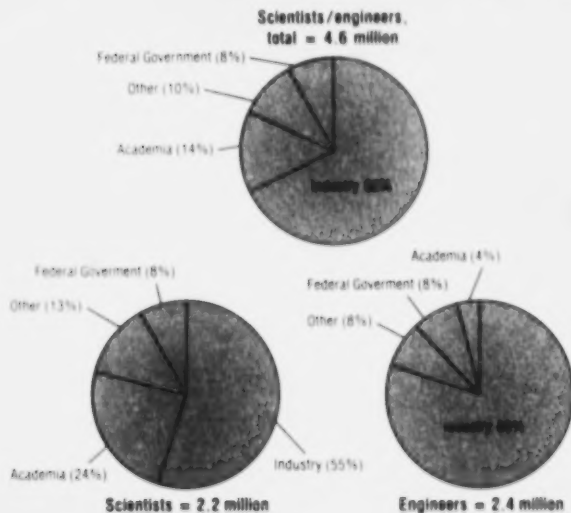
Figure 19. Scientists and engineers by field and citizenship: 1986

Field	Total	U.S.	Non-U.S.	No report
Scientists/engineers, total	4,971,990	4,770,090	147,000	53,200
Astronomy	2,257,000	2,254,400	80,000	13,000
Physical sciences	312,700	297,000	13,400	1,000
Mathematical sciences	140,000	135,000	4,000	700
Computer sciences	275,700	230,200	21,500	4,000
Earth/atmospheric sciences	100,000	110,000	3,200	1,100
Life sciences	400,000	400,000	11,000	1,300
Psychology	200,000	200,000	3,000	1,500
Social sciences	400,000	444,000	11,000	3,200
Engineers, total	800,000	2,310,000	70,000	50,000
Aeronautical/astronautical	117,000	118,100	2,100	2,000
Chemical	175,000	162,700	6,000	1,000
Civil	201,000	200,000	10,100	5,100
Electrical/electronic	220,700	200,400	22,300	9,000
Mechanical	247,700	223,000	17,000	7,100
Other engineers	700,000	700,400	21,400	14,500

SOURCE: National Science Foundation

Additional information may be obtained from Michael F. Crowley, SRS, Tel. (202) 634 4664

Figure 20. Employed scientists and engineers by primary work sector: 1986

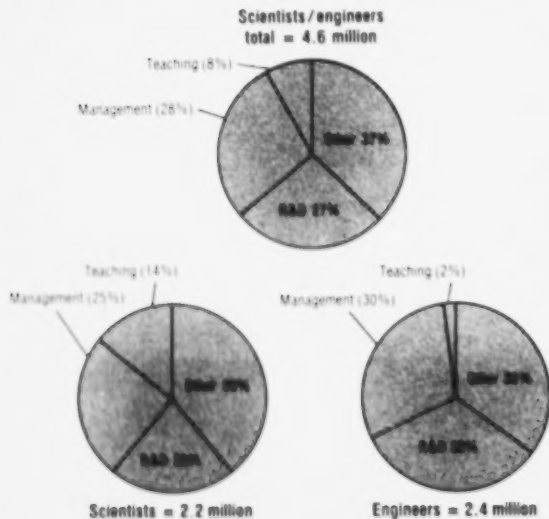


Field and sector of employment	1980	1984	1986
Scientists/Engineers			
Total	3,851,330	3,888,300	4,068,900
Industry	2,125,000	2,143,000	2,254,500
Academia	567,000	577,000	617,000
Federal Government	318,000	327,000	358,100
Other Government	134,000	133,000	141,700
Other	207,330	214,300	298,200
Engineers			
Total	3,000,000	3,000,000	3,160,000
Industry	1,650,000	1,650,000	1,763,700
Academia	300,000	300,000	320,000
Federal Government	150,000	150,000	157,000
Other Government	74,000	74,000	77,000
Other	126,000	126,000	142,300
Scientists			
Total	1,725,000	1,725,000	1,845,000
Industry	975,000	975,000	1,040,000
Academia	267,000	267,000	280,000
Federal Government	150,000	150,000	157,000
Other Government	74,000	74,000	77,000
Other	126,000	126,000	142,300
Engineers			
Total	1,275,000	1,275,000	1,315,000
Industry	650,000	650,000	723,700
Academia	33,000	33,000	40,000
Federal Government	100,000	100,000	107,000
Other Government	50,000	50,000	53,000
Other	142,000	142,000	162,300

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SOURCE: National Science Foundation
 Additional data may be obtained from Michael F. Crowley, SRS, Tel: (202) 634-4864

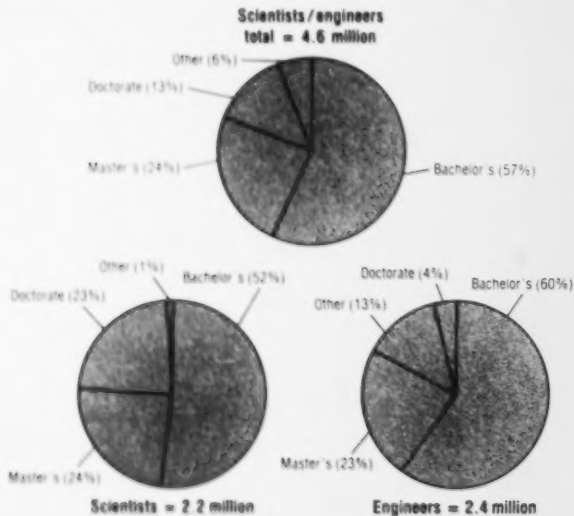
Figure 21. Employed scientists and engineers by primary work activity: 1986



Field and primary work activity	1975	1984	1986
Scientists/engineers, total	2,331,328	3,065,080	4,065,580
R&D	868,000	1,129,700	1,508,900
Management	587,100	1,190,000	1,282,300
Teaching	193,300	295,300	357,800
Consulting	115,300	188,000	232,100
Production/inspection	58,300	240,300	332,000
Ext./int./comptrol	187,700	375,100	472,800
Other/No report	342,900	385,000	410,100
Scientists, total	1,250,500	1,781,400	2,188,300
R&D	331,100	401,100	473,700
Management	282,400	433,000	505,800
Teaching	141,300	250,300	300,800
Consulting	68,300	110,300	140,400
Production/inspection	30,300	130,300	170,000
Ext./int./comptrol	100,300	210,300	260,800
Other/No report	187,900	285,000	327,100
Engineers, total	1,080,828	1,283,680	1,877,280
R&D	436,900	728,600	1,035,200
Management	300,700	756,700	776,500
Teaching	52,000	45,000	57,000
Consulting	47,300	72,700	91,700
Production/inspection	28,000	110,000	162,000
Ext./int./comptrol	100,000	100,000	100,000
Other/No report	78,900	81,600	85,600

SOURCE: National Science Foundation
Additional data may be obtained from Michael F. Crowley, SRS, Tel: (202) 634-4064

Figure 22. Employed scientists and engineers by highest degree: 1986



Field and highest degree	1980	1984	1986
Scientists/engineers total	4,021,500	4,480,500	4,630,000
Bachelor's	2,300,000	2,550,000	2,650,000
Master's	950,000	1,050,000	1,120,000
Doctorate	650,000	770,000	840,000
Other	120,000	110,000	220,000
Scientists total	2,800,000	3,050,000	3,150,000
Bachelor's	1,500,000	1,650,000	1,700,000
Master's	650,000	750,000	820,000
Doctorate	550,000	650,000	710,000
Other	100,000	100,000	20,000
Engineers total	1,221,500	1,430,500	1,480,000
Bachelor's	800,000	900,000	980,000
Master's	300,000	300,000	310,000
Doctorate	120,000	150,000	160,000
Other	100,000	80,000	30,000

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NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation

Additional data may be obtained from Michael F. Crowley, SRS, Tel. (202) 634-4664.

Figure 23. Doctoral scientists and engineers by field and citizenship: 1985



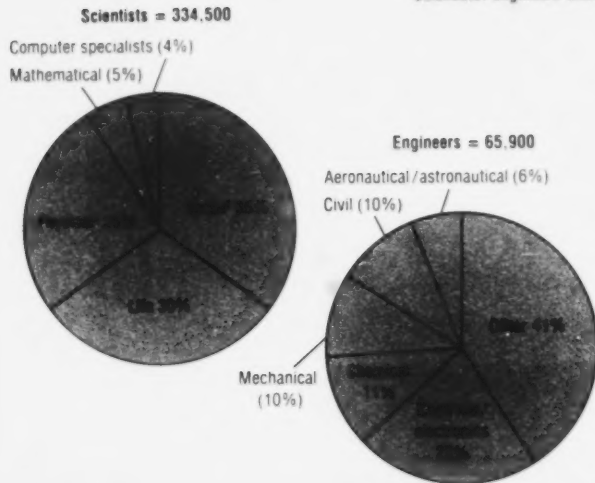
(1) Too few cases to estimate

SOURCE: National Science Foundation

Additional information may be obtained from Michael F. Crowley, SRS, Tel: (202) 634-4884.

Figure 24. Employed doctorates in science and engineering by field: 1985

Scientists/engineers total = 400,400



Field	1980	1985	1990
Scientists/engineers	334,500	400,400	466,300
Life sciences	102,500	127,350	152,200
Physical sciences	83,600	102,600	122,100
Computer specialists	13,400	13,380	13,360
Mathematical	16,700	16,740	16,780
Other	101,300	129,530	153,960
Engineers	65,900	65,900	65,900
Aeronautical/astronautical	3,950	3,950	3,950
Civil	6,590	6,590	6,590
Mechanical	6,590	6,590	6,590
Chemical	8,360	8,360	8,360
Electrical/electronic	13,180	13,180	13,180
Other	28,330	28,330	28,330

*Includes environmental scientists: 5 percent of total scientists

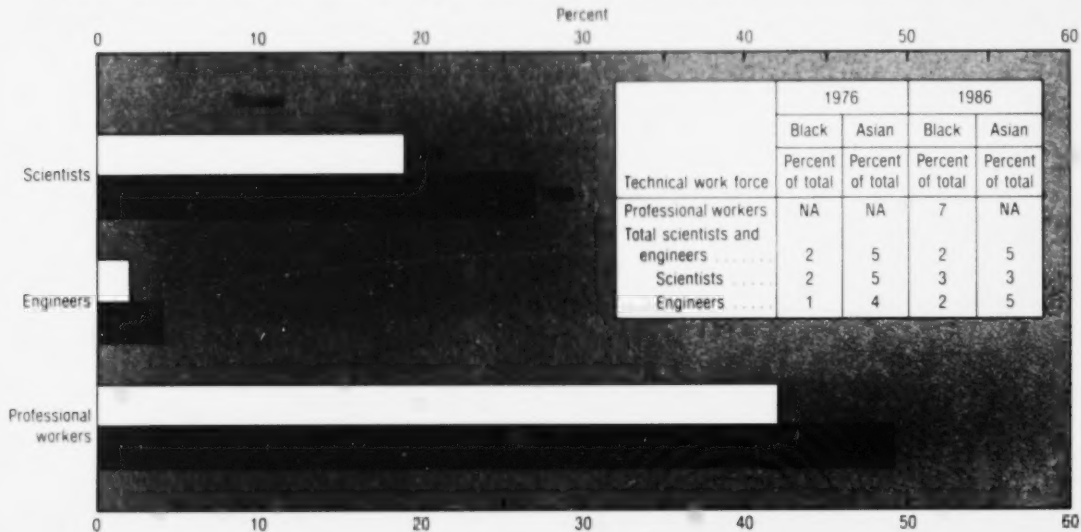
*Includes psychologists: 16 percent of total scientists

NOTE: Because of rounding, components may not add to totals

SOURCE: National Science Foundation

Additional data may be obtained from Michael F. Crowley, SRS, Tel: (202) 634-4664

Figure 25. Women and racial minorities as a proportion of all employed scientists, engineers, and professional workers

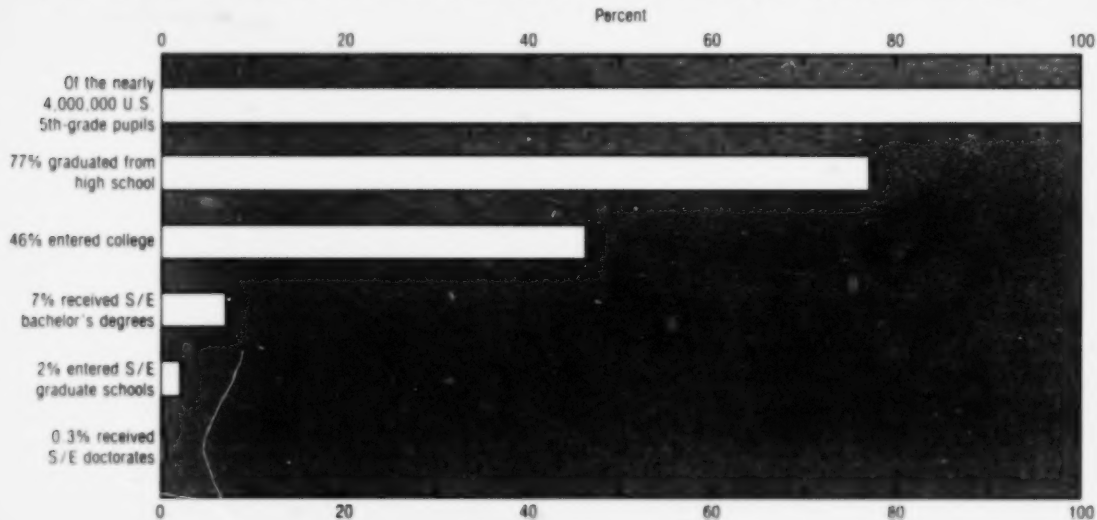


NOTE: NA = not available

SOURCES: National Science Foundation and Department of Labor

Additional data may be obtained from Michael F. Crowley, SRS, Tel: (202) 634-4664

Figure 26. Retention rates for U.S. citizens, fifth grade through receipt of science/engineering (S/E) doctorate: 1966-86



NOTE: Calculations are based on estimates of enrollment and degree awards to U.S. citizens only.

SOURCES: Center for Education Statistics and National Science Foundation.

Additional data may be obtained from Mary A. Golladay, SRS, Tel: (202) 634-4787.

Figure 27. Bachelor's degrees awarded in major science/engineering fields

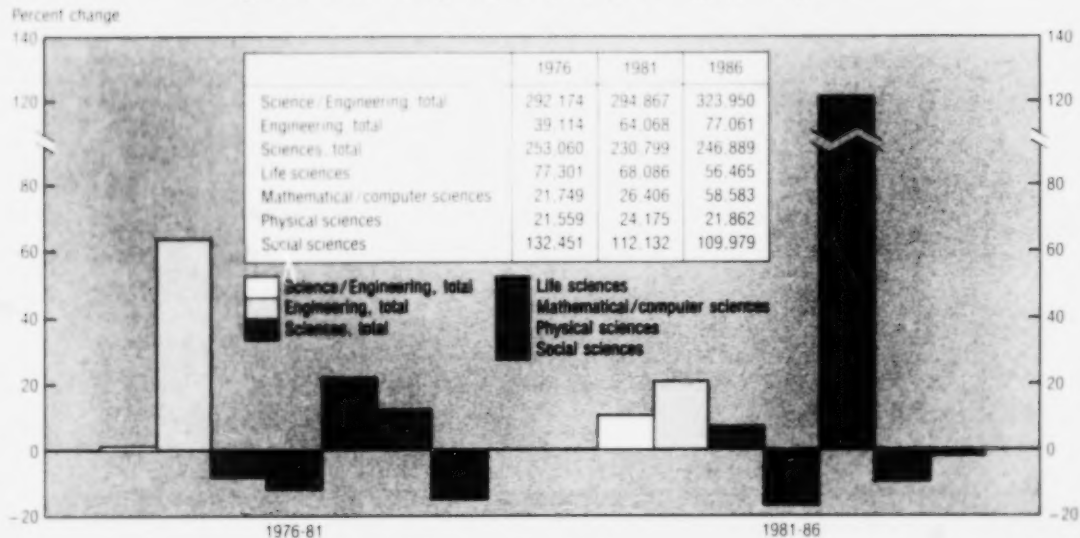
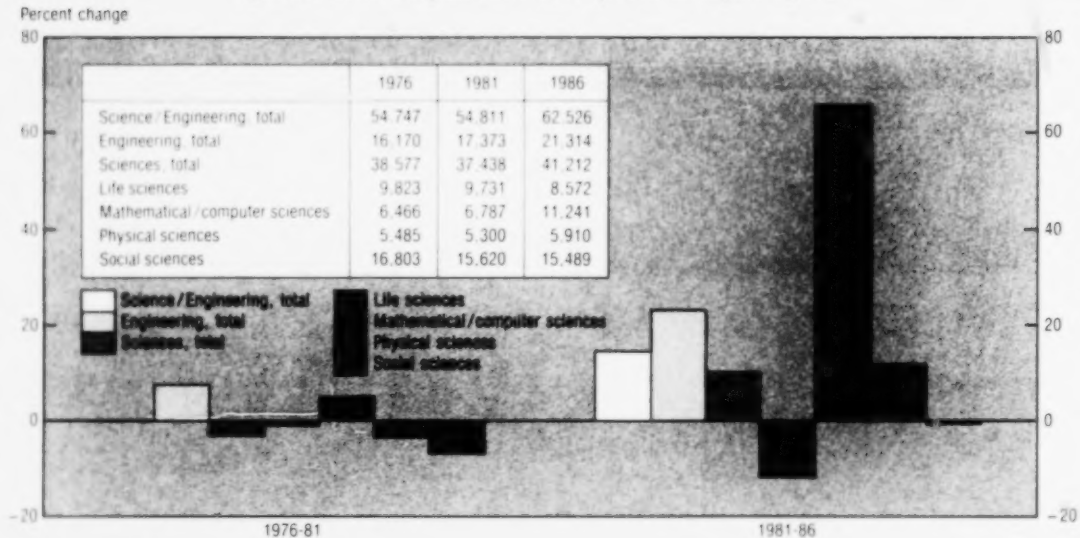
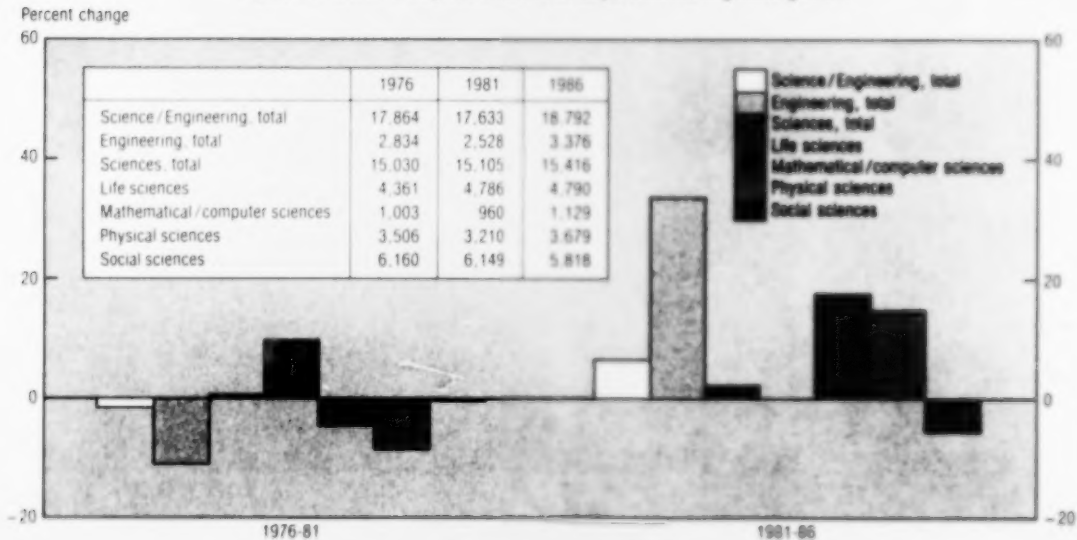


Figure 28. Master's degrees awarded in major science/engineering fields



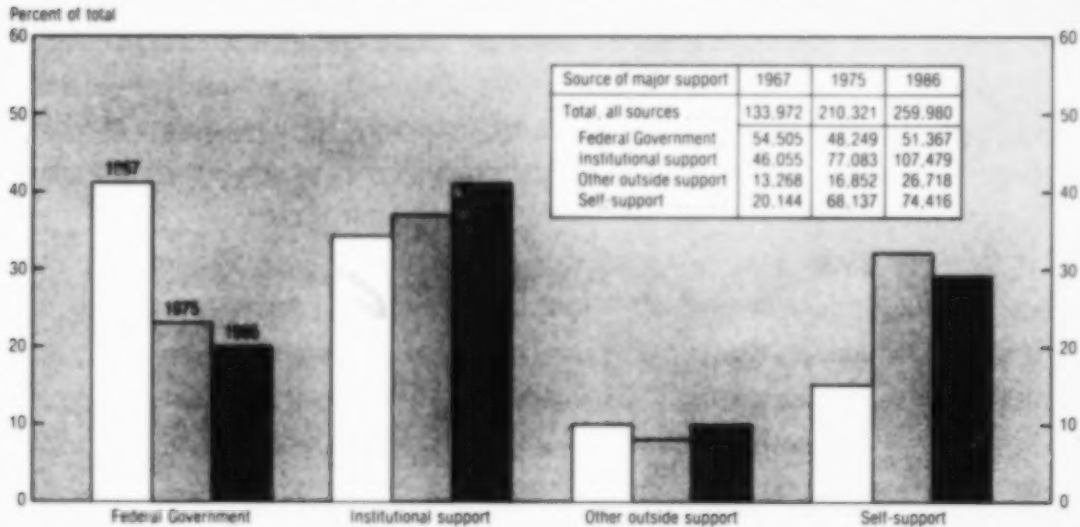
SOURCE: Center for Education Statistics and National Science Foundation
Additional data may be obtained from Mary A. Golladay, SRS. Tel: (202) 634-4797

Figure 29. Doctor's degrees awarded in major science/engineering fields



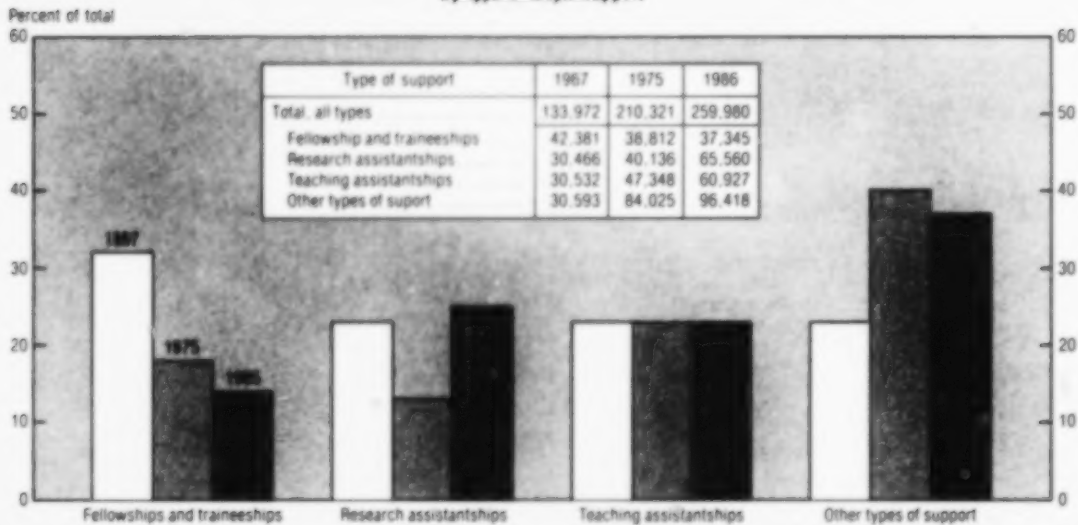
SOURCE: National Science Foundation
Additional data may be obtained from Mary A. Guldady, SRS, Tel: (202) 634-4787

Figure 30. Full-time science/engineering graduate students in doctorate-granting institutions by source of major support



SOURCE: National Science Foundation
 Additional data may be obtained from Mary A. Gonsky, SRS, Tel: (202) 634-4787

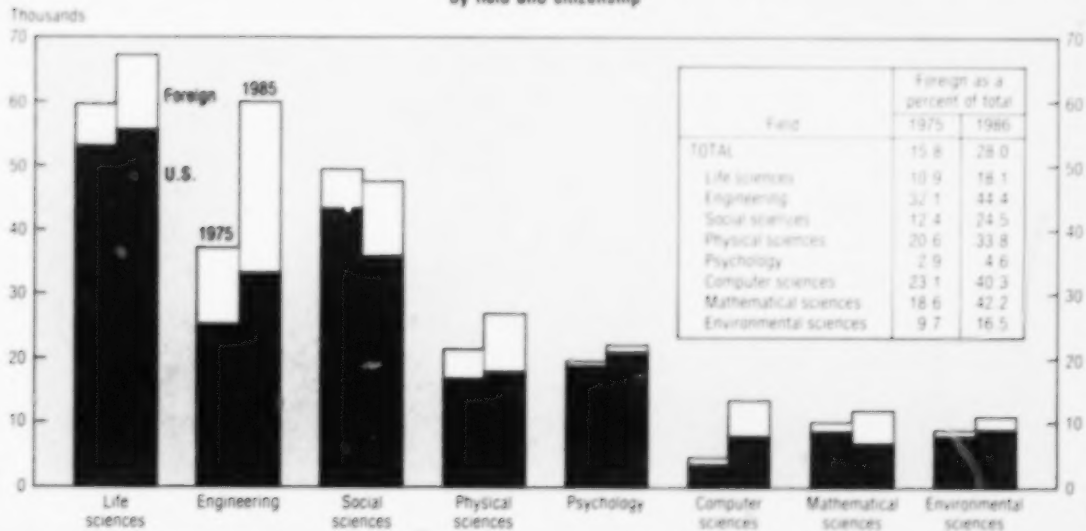
**Figure 31. Full-time science/engineering graduate students in doctorate-granting institutions
by type of major support**



SOURCE: National Science Foundation

Additional data may be obtained from Mary K. Golladay: 205, Tel. (202) 634-4787

Figure 32. Full-time science/engineering graduate students in doctorate-granting institutions by field and citizenship

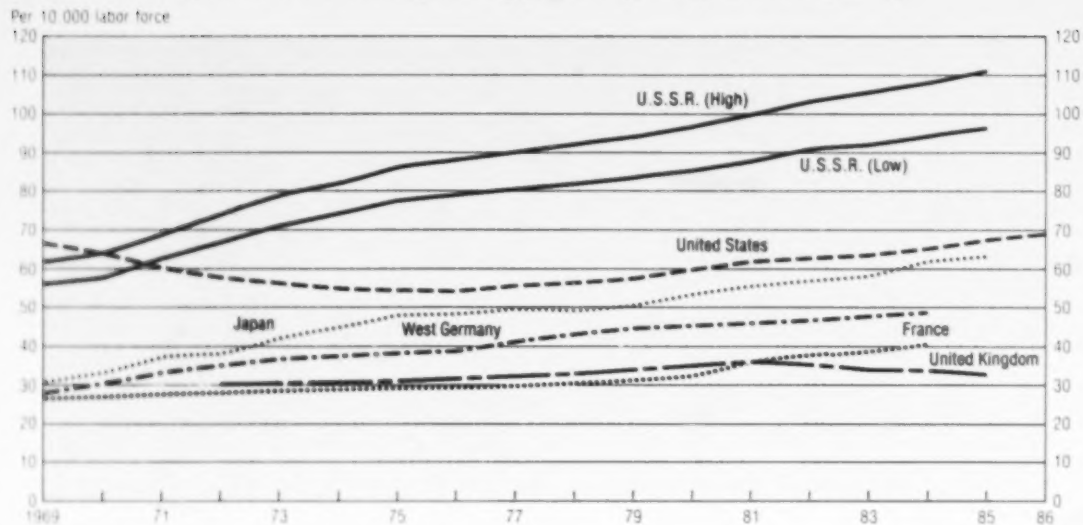


SOURCE: National Science Foundation
 Additional data may be obtained from Mary A. Galatow, SRS, Tel. (202) 634-4787

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INTERNATIONAL S/T INDICATORS

Figure 33. Scientists and engineers engaged in R&D per 10,000 labor force by country



NOTE: A range has been provided for the U.S.S.R. because of the difficulties inherent in comparing Soviet scientific personnel data.
 SOURCE: National Science Foundation, Organization for Economic Cooperation and Development. (© Robert Campbell, Indiana University).
 Additional data may be obtained from Cipro Kuyubashli, SRI, Tel. (510) 634-4662.

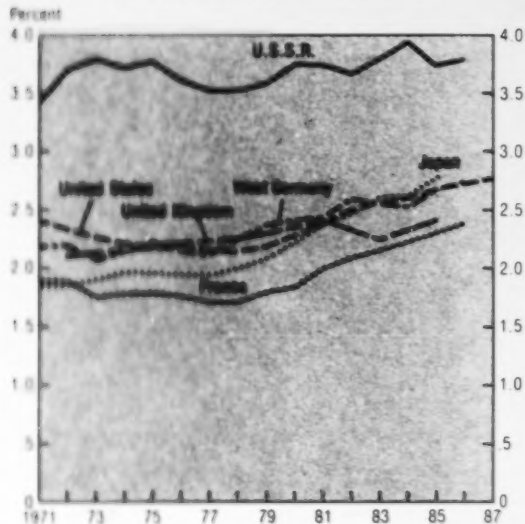
Figure 34. Scientists and engineers engaged in research and development by country: 1965-86
[In thousands]



NOTES: Table includes all scientists and engineers engaged in research and development on a full-time basis except Japan, whose data include persons primarily employed in research and development, and the United Kingdom whose data include only the Government and industry sectors. The figures for West Germany increased in 1979 in part because of increased coverage of small and medium enterprises not surveyed in 1977. The figures for France increased in 1981 in part due to a re-evaluation of university research efforts. The 1985 and 1986 figures for West Germany and the United Kingdom are WEF estimates. NA = Not available.

SOURCES: National Science Foundation, Organisation for Economic Co-operation and Development and national country data. Data for the Soviet Union were provided by Robert Campbell, Indiana University, and Harley Becker, Georgetown University. Additional data may be obtained from Jennifer Boyd, SRS, Tel: (202) 854-4840.

Figure 35. R&D/GNP ratios by country



Historical data for nondefense R&D in the U.S.S.R. not available

SOURCE: National Science Foundation and Organisation for Economic Co-operation and Development

Additional data may be obtained from Carlos Kruytbech, SRS, Tel: (202) 634-4682

Nondefense R&D/GNP by country*

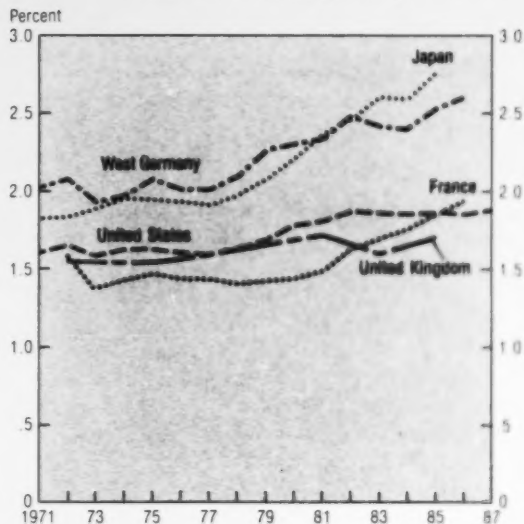


**Figure 36. National expenditures on research and development¹
by source of funds²: selected years**



¹Gross expenditures for performance of R&D including associated capital expenditures, except for the United States where total capital expenditure data are not available.

²Data are deflated using the implicit GDP price deflator, except for the United States, for which the GNP deflator is used. Deflated data are transformed into dollars using the 1975 purchasing power parity.

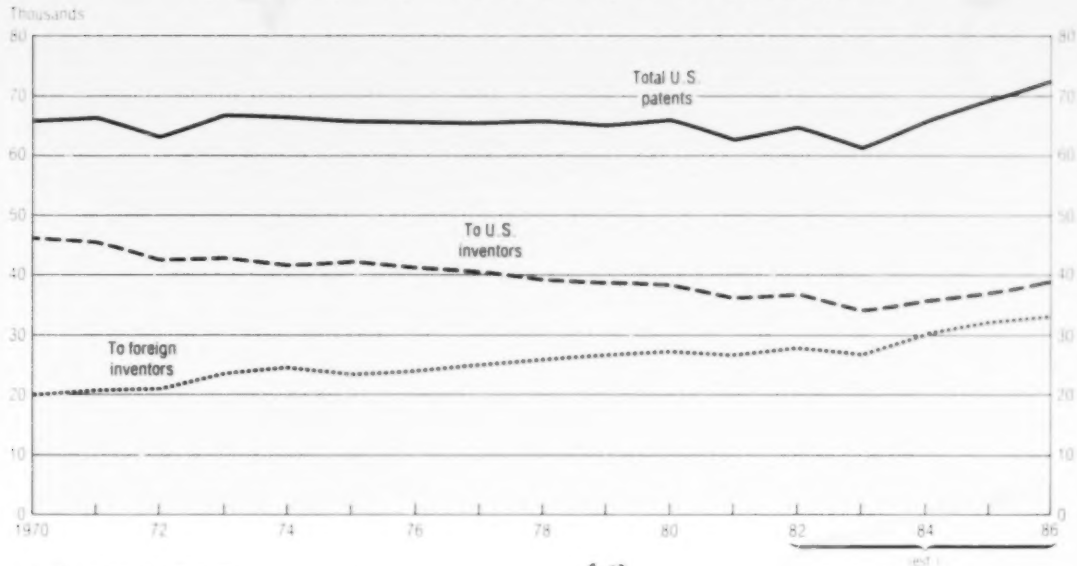
³United Kingdom data for 1970 are for fiscal year 1969, and 1979 for fiscal year 1978.

NOTE: NA = not available.

SOURCES: OECD, Science and Technology Indicators Recent Results, June 1984; National Science Foundation, National Patterns of Science and Technology Resources, 1987 in press; OECD, International Statistical Year 1983.

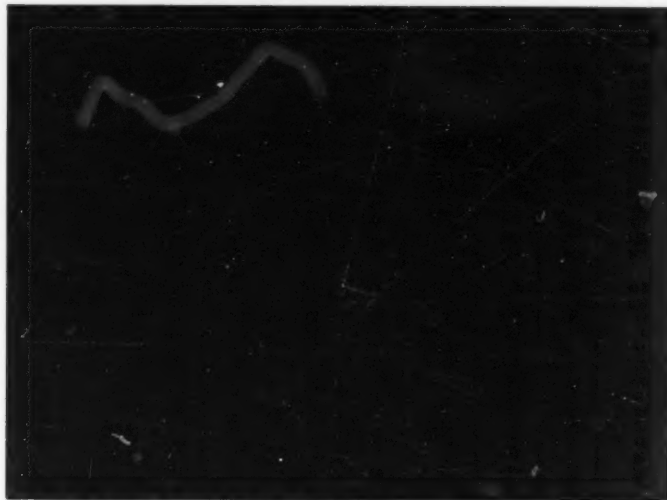
Additional data may be obtained from Jennifer Bond, SRS, Tel: (202) 634-4840.

Figure 37. U.S. patents granted to U.S. and foreign inventors by year of application



Source: U.S. Patent and Trademark Office.
 Additional data may be obtained from Table 4, Appendix, 1985, for 1970-1984.

Figure 38. U.S. receipts and payments of royalties and license fees associated with unaffiliated residents of selected countries
(Millions of dollars: constant (1982)¹)



¹GDP implicit price deflators used to convert current to constant 1982 dollars.

NOTE: NA = Not available

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, unpublished data

Additional data may be obtained from Carlos Krzyzbasch, SAB, Tel: (202) 634-4882.

Figure 39. Foreign direct investment in the United States

[Millions of dollars, constant 1982]¹

	1979	1980	1981	1982	1983	1984	1985
Total direct investment	888,579	888,878	943,138	944,885	945,884	948,828	954,518
Total under contract	18,887	NA	28,388	28,742	34,822	38,732	38,727
Canada	4,871	41,786	2,583	2,588	3,188	3,814	4,800
France	1,388	NA	1,172	4,874	3,283	4,878	4,918
West Germany	1,178	NA	4,482	4,388	4,388	4,888	8,568
Netherlands	1,128	NA	2,288	2,288	18,888	11,588	11,848
United Kingdom	8,871	NA	8,884	8,887	8,878	8,888	18,888
Japan	9,48	4,828	1,388	1,884	2,878	2,888	2,388
Sweden	NA	NA	2,888	2,884	1,878	4,828	8,883
Switzerland	NA	NA	4,882	2,731	8,844	3,788	3,338
Other countries	2,718	NA	18,888	11,328	11,822	12,288	14,788

¹GNP implicit price deflators used to convert current dollars to constant 1982 dollars.

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis, Selected Data on U.S. Direct Investment Abroad, 1966-78 (1980), Survey of Current Business (February 1981).

pp. 10-51, Survey of Current Business (annual, August issues).

Additional data may be obtained from Carlos Kruglbosch, IRS, Tel. (202) 634-4682.

Figure 40. Gross domestic product per employed person

Thousands of dollars, constant (1986)

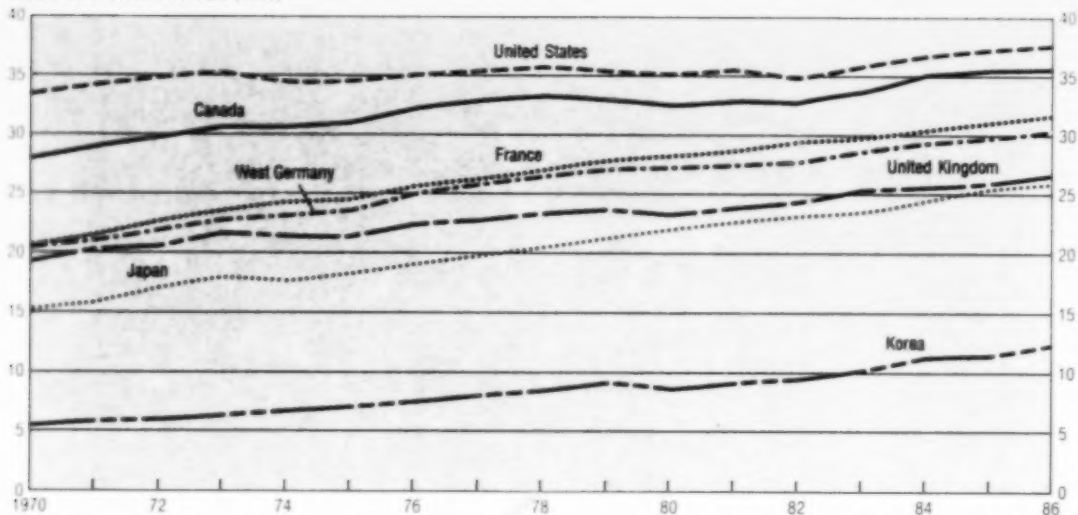


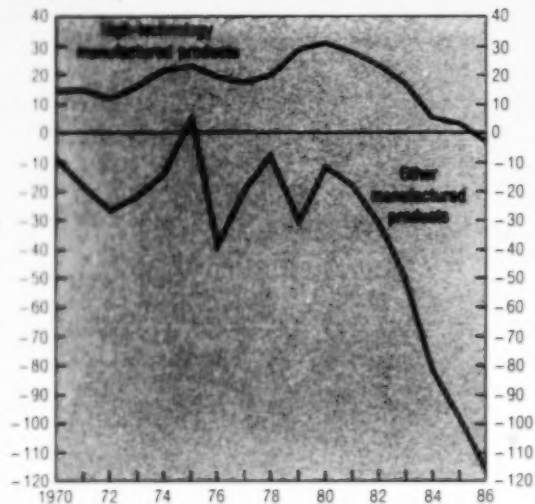
Figure 41. U.S. trade balance^a in high-technology and other manufactured produce groups

[Billions of dollars: constant 1982^b]

Year	High-technology ^a		Other		Total	
	Exports	Imports	Exports	Imports	Exports	Imports
1970	18.7	11.3	15.2	10.8	33.9	22.1
1971	18.5	11.5	15.0	11.0	33.5	22.5
1972	18.0	12.0	14.5	11.5	32.5	23.5
1973	18.2	11.8	14.7	11.3	32.9	23.1
1974	17.7	12.3	14.0	11.0	31.7	23.3
1975	17.9	12.1	14.2	10.7	32.1	22.8
1976	18.4	11.6	14.5	10.4	32.9	22.0
1977	18.6	11.4	14.7	10.2	33.3	21.6
1978	18.8	11.2	14.9	10.0	33.7	21.2
1979	18.9	11.1	15.0	9.9	33.9	21.0
1980	19.1	10.9	15.2	9.7	34.3	20.6
1981	19.3	10.7	15.4	9.5	34.7	20.2
1982	19.5	10.5	15.6	9.3	35.1	19.8
1983	19.7	10.3	15.8	9.1	35.5	19.4
1984	19.9	10.1	16.0	8.9	35.9	19.0
1985	20.1	9.9	16.2	8.7	36.3	18.6
1986	20.3	9.7	16.4	8.5	36.7	18.2

^aConverted to constant dollars using the GNP implicit price deflator

^bU.S. Department of Commerce DOC 3 definitions.

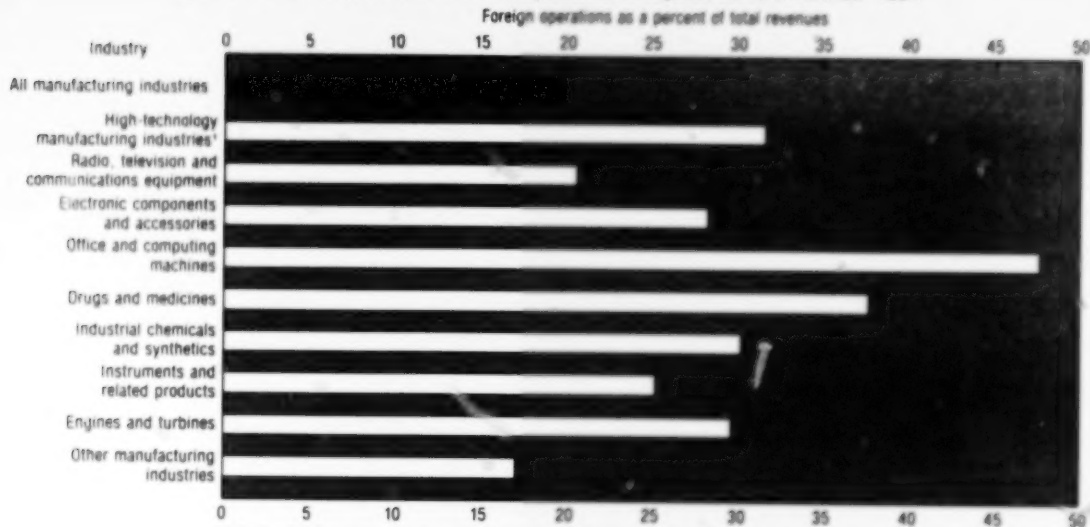


^aExports less imports.

SOURCE: Department of Commerce, International Trade Administration.

Additional data may be obtained from Carlos Kruybosch, SRS, Tel. (202) 634-4682.

Figure 42. Total foreign revenue of U.S. corporations, as a percent of total revenue: 1984



SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis; U.S. Direct Investment Abroad: Operations of U.S. Parent Companies and their Foreign Affiliates, Preliminary 1984 Estimates (October, 1986), Tables 2, 17; U.S. Department of Commerce, International Trade Administration, United States Trade Performance in 1985 and Outlook (October, 1986); U.S. Department of Commerce, Bureau of the Census, 1984 Annual Survey of Manufactures: Statistics for Industry Groups and Industries, 8004-05; 1 July, 1986; U.S. Congress, Office of Technology Assessment, Trade in Services: Exports and Foreign Revenues — Special Report, OTA-ITC-315 (September, 1986).

Additional data may be obtained from Carlos Krzyzbasch, SRS, Tel: (302) 634-4902.

Figure 43. Exports of high-technology products as a percent of shipments: 1978-85

Product group	1978	1979	1980	1981	1982	1983	1984	1985
Exports as a percent of shipments								
All manufacturing products	6.2	6.8	6.4	6.3	7.0	7.0	7.0	6.9
All high-technology products	12.1	10.7	10.5	10.4	10.7	10.6	17.2	17.3
Aerospace, defense and aerospace	6.4	6.0	7.3	4.7	8.8	6.6	9.3	4.7
Communications equipment and								
electronics equipment	10.3	17.0	15.3	15.1	10.3	11.4	16.9	12.0
Electronic parts	10.3	17.0	16.6	16.6	10.3	14.2	16.0	17.9
Office and computing equipment	10.1	10.7	10.3	17.7	10.2	11.3	12.1	17.0
Electronic test equipment	11.3	10.3	10.7	10.0	10.0	10.7	10.5	15.0
Image and recording	10.8	10.4	11.2	11.2	10.2	10.2	9.9	9.2
Industrial computer products	10.0	10.1	10.6	10.1	10.6	9.9	10.6	10.0
Professional and scientific								
equipment	10.0	10.0	17.4	10.1	10.0	10.3	10.0	21.4
Plastic materials, machinery	9.7	10.0	10.0	14.0	14.0	11.0	12.2	12.5
Other manufacturing products	4.8	4.8	6.4	6.2	6.8	6.0	4.0	4.8

¹ U.S. Department of Commerce DCC-3 definitions.

SOURCES: U.S. Department of Commerce, International Trade Administration, U.S. Trade Performance in 1983 and Outlook (June 1984); and unpublished data, Bureau of the Census, Statistical Abstract of the United States, 1986 (1987). Bureau of the Census, Annual Survey of Manufactures, value of Product Shipments 1980-85; 21, January 1987 and previous editions.

Additional data may be obtained from Carlos Krueger, SRS, Tel. (202) 634-4682.

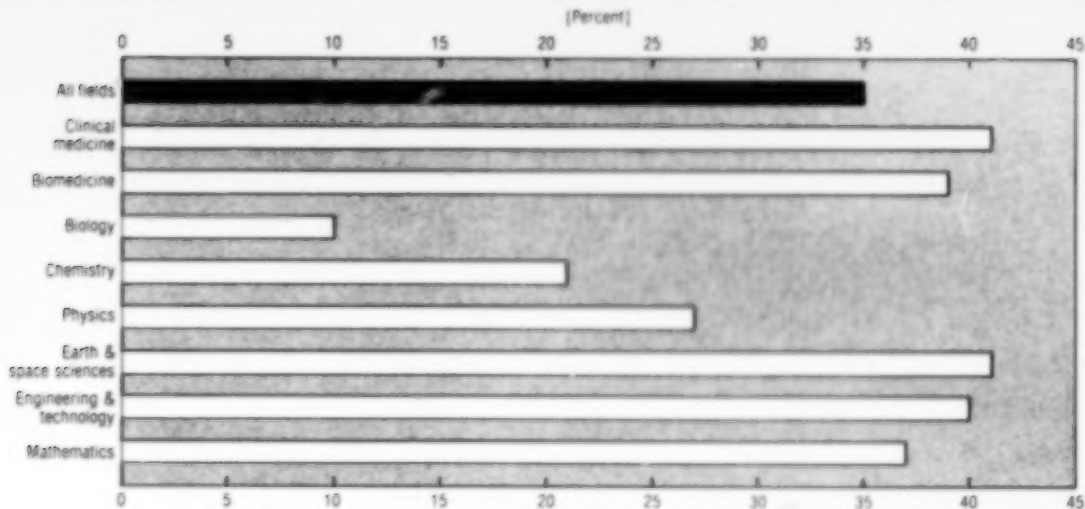
Figure 44. Export market shares, selected high-technology products: 1975, 1982, 1985

Product Group	United States			Japan			West Germany			France			United Kingdom		
	1975	1982	1985	1975	1982	1985	1975	1982	1985	1975	1982	1985	1975	1982	1985
	Market Shares [Percent]														
Communications equipment & electronic components.....	18.8	21.1	16.1	23.9	36.8	37.0	16.1	12.2	12.7	6.5	8.3	7.9	7.2	8.3	8.6
Aircraft & parts.....	62.2	45.9	50.0	0.3	0.0	0.4	4.1	16.6	11.7	7.8	9.4	9.7	14.3	15.5	14.8
Office, computing, & accounting machines.....	30.1	36.7	33.1	11.0	17.6	17.7	17.2	12.2	10.4	6.0	6.2	5.6	11.2	9.0	10.4

SOURCE: Victoria, Austr.: U.S. High Technology Trade and Competitiveness: Yearbook 1985. (Department of Commerce, International Trade Administration, Office of Trade and Investment Analysis, February 1985). Not unpublished statistics.

Additional data may be obtained from Victoria Book 1985. Tel.: (03) 434 4444.

Figure 45. U.S. scientific and technical (S/T) publications as a percent of world S/T publications: 1984



NOTE: These data are based on the articles, notes, and reviews in over 3,500 influential journals carried in the 1985 Science Citation Index of the Institute for Science Information. An article written by researchers from more than one country is prorated across the countries involved.

SOURCE: Computer Horizons, Inc.

Additional data may be obtained from Carolus Krupp/Beach, SRS, Tel.: (202) 634-4662.

Other Science Resources Publications

Highlights

R&D Funds

Single copies of the following publications may be obtained gratis from the National Science Foundation, Washington, D.C. 20550.

	NSF No.
"Industrial Biotechnology R&D Performance Exceeded \$1 Billion in 1985"	87-304
"Despite Continued High Level of Defense-Related R&D Spending, Growth in Nation's R&D Effort Slows"	87-303
"Academic R&D Expenditures Expected to Continue Substantial Growth Through FY 1986"	87-302
"Growth in Company-Funded Research and Development Expected to Slow in 1987"	86-314

S/E Personnel

"Recent-Doctorate Faculty Increase in Engineering and Some Science Fields"	87-310
"Foreign Students Fueled 2% Rise in 1985 Graduate Science and Engineering Enrollment"	87-306
"Employment of Ph.D. Scientists and Engineers in Industry Continues to Increase"	87-301
"Output of Science and Engineering Doctorates Stable in 1985, But Non-U.S. Citizens and Women Increase Their Shares of the Total"	86-308

Detailed Statistical Tables

NOTE: The Detailed Statistical Tables listed below carry an SRS rather than an NSF Number and are available from the Division of Science Resources Studies only on diskette and on the SRS Electronic Bulletin Board. Paper copies may be purchased from the National Technical Information Service. For further information, please call (201) 634-4622.

Detailed Statistical Tables available through the SRS Electronic Bulletin Board are also free of charge. The telephone number is (202) 634-1764. The Board is capable of handling 300, 1200, or 2400 Baud, with 8 data bits, No parity, 1 stop bit, and XMODEM protocol.

R&D Funds

	NSF No.
Academic Research Equipment in the Physical and Computer Sciences and Engineering: 1982 and 1985	SRS 87-D6
Academic Science/Engineering: R&D Funds: Fiscal Year 1985	SRS 87-D3
Federal Funds for Research and Development: Fiscal Years 1985, 1986, and 1987, Volume XXXV	SRS 87-D1
Federal Support to Universities, Colleges, and Selected Nonprofit Institutions: Fiscal Year 1985	SRS 87-D2
Research and Development in Industry: 1985. Funds, 1985; Scientists and Engineers, January 1986	SRS 87-D7

S/E Personnel

Academic Science/Engineering: Graduate Enrollment and Support, Fall 1985	SRS 87-D5
Academic Science/Engineering: Scientists and Engineers, January 1985	SRS 86-D4
Characteristics of Doctoral Scientists and Engineers in the United States: 1985	SRS 86-D2
Characteristics of Recent Science/Engineering Graduates: 1984	SRS 86-D1
Federal Scientists and Engineers: Fiscal Year 1985	SRS 87-D4
Science and Engineering Doctorates: 1960-86	SRS 87-D9
Scientists, Engineers, and Technicians in Manufacturing Industries: 1983	SRS 86-D5
Scientists, Engineers, and Technicians in Nonmanufacturing Industries: 1984	SRS 86-D6
Scientists, Engineers, and Technicians in Trade and Regulated Industries: 1985	SRS 87-D8
U.S. Scientists and Engineers: 1984	SRS 86-D2

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	NSF No
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Foreign Citizens in U.S. Science and Engineering: History, Status, and Outlook	86-305 rev.
International Science and Technology Data Update: 1987	86-307
National Patterns of Science and Technology Resources: 1986	86-309
Profiles — Chemistry: Human Resources and Funding	87-307
Profiles — Mechanical Engineering: Human Resources and Funding	87-309
Science and Engineering Indicators — 1987	NSB 88-1
Science and Engineering Personnel: A National Overview	85-302
Women and Minorities in Science and Engineering	86-301

R&D Funds

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International

The Science and Technology Resources of West Germany: A Comparison with the United States	86-310
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